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03500.015726.

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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| In re Application of: | ) | |
| | : | Examiner: M. P. Hodges |
| TAKEO TSUKAMOTO | ) | |
| | : | Group Art Unit: 2879 |
| Application No.: 09/941,595 | ) | |
| | : | |
| Filed: August 30, 2001 | ) | |
| | : | |
| For: ELECTRON-EMITTING DEVICE, ELECTRON SOURCE AND IMAGE-FORMING APPARATUS, AND METHOD FOR MANUFACTURING ELECTRON EMITTING DEVICE | ) | November 30, 2004 |

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT

Sir:

In compliance with the duty of disclosure under 37 C.F.R. § 1.56 and in accordance with the practice under 37 C.F.R. §§ 1.97 and 1.98, the Examiner's attention is directed to the documents listed on the enclosed Form PTO-1449. Copies of the documents listed on the Form PTO-1449 and a copy of a Japanese Official Letter citing these documents are enclosed.

I hereby certify that this correspondence is being deposited with the United States Postal Service as first-class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on

November 30, 2004
(Date of Deposit)

Frank A. DeLucia
(Name of Attorney for Applicant)

Signature

November 30, 2004
Date of Signature

Applicant represents that the Japanese Official Letter, in a section that has been marked by *① for the Examiner's convenience, states the following:

*①

"The present invention is obvious in view of following cited documents published before the filing of the present application. Accordingly, the present has been rejected under Article 29, Paragraph 2 of the Patent Law.

Note

Cited Documents

Reference 1 : JP11-194134
Reference 2 : JP08-100328
Reference 3 : JP11-139815
Reference 4 : JP2000-191302
Reference 5 : JP09-237565

Claims : 1 - 35
Cited Documents : 1 - 5

Remarks

The reference 1 discloses an electron-emitting device wherein a carbon nanotube is arranged on a layer of an oxide of A1 or Ti.

The reference 2 discloses a technique for producing a carbon nanotube with Pd catalyst.

The reference 3 discloses that, in a vapor phase growth process, a catalyst is disposed at an end of a carbon nanotube (refer to a paragraph [0009]).

The reference 4 discloses one configuration of a carbon nanotube wherein graphens are laminated."

The Japanese Official Letter also states, in a section that has been marked by *② for the Examiner's convenience, the following:

*②

"The reference 5 discloses a technique of lateral electron-emitting device wherein an electron-emitting member is disposed on an emitter electrode (see paragraphs (0063) - (0071) and Figs. 9-11).

Accordingly, the present invention defined in claims 1-35 can be readily deduced by those skilled in the art based on a combination of the references 1-5 and well-known technique and design change."

Document JP11-139815, which is cited in the Japanese Official Letter, is not listed on the Form PTO-1449, because that document is already of record. However, a further copy of that document, and an English abstract are submitted herewith merely for the Examiner's convenience and further understanding of a concise statement of relevance.

Applicant represents that the non-English document JP11-139815 states, in the section that has been marked *③ for the Examiner's convenience, the following:

"(0009)

3) A vapor growth system carbon fiber one typical example is as follows. With hydrogen as a carrier gas, a benzene steam is sent into an electric furnace maintained at a temperature equal to or lower than 1050°C thereby growing on a substrate using an iron as a catalyst. The growth process considers three kinds of the direction growth periods of a path which increases a size in nucleation, very thin growth of the shaft orientations of a fiber, and the direction of a path of a fiber. The ultrafine particle of about 10nm iron is required for a catalyst. And after a fiber is obtained, the catalyst exists at the tip of a fiber as Fe3, C. It is thought that hydrogen gas also has operations of reduction of iron and suppressing of the pyrolysis of benzene. The obtained fiber consists of the thick periphery section which arranges from a core almost in parallel with a hollow tube, a flat and thin mesh layer, and a shaft, and has an about 1mm mesh. The hollow tube which has a thin mesh layer by the flatness near a core is what the iron catalyst became a nucleus and was able to do it, and the thick periphery section is considered to have been obtained by the pyrolysis of the benzene. Such a tube is seen also when gaseous-phase pyrolysis of the carbon monoxide is carried out by making iron into a catalyst. G. G. Tibbetss is that the same fiber is obtained even if it uses methane J. Cryst. Growth and 73 (1985) 431 it is explaining."

Document JP11-194134, which is cited in the Japanese Official Letter, also is not listed on the Form PTO-1449, because that document is already of record. However, a copy of a further English abstract is submitted herewith merely to supply a concise statement of relevance. Moreover, for a further concise statement of relevance of document JP11-194134, the Examiner is referred to counterpart U.S. Patent 6,628,053.

For the concise statement of relevance of non-English document JP08-100328, the Examiner is respectfully referred to the attached English Abstract, submitted herewith to supply a concise statement of relevance for the non-English document.

Also, for the concise statement of relevance of non-English document JP2000-191302, the Examiner is respectfully referred to the attached English Abstract, submitted herewith to supply a concise statement of relevance for the non-English document.

Document JP09-237565, which is cited in the Japanese Official Letter, is not listed on the Form PTO-1449, because that document is already of record. However, a further, partial copy of that document, and an English abstract are submitted herewith for the Examiner's convenience in understanding a concise statement of relevance.

Applicant represents that the non-English document JP09-237565 states, in a section that has been marked *④ for the Examiner's convenience, the following:

*④

"[0063] (Example 2) Drawings 9-11 are drawings showing the production process of the field-electron-emission component of the broadside of this example. On the quartz substrate (insulating substrate) (91) with a thickness of 1mm, 1-micrometer Si layer (92) was stuck like the example 1, and the silicone carbide film (93) with a thickness of 1 micrometer was formed with the CVD method by the same conditions as Table 2 (drawing 9 (a) ). 70 ppm N (nitrogen) was added as an impurity by using NH3 of 0.5sccm (s) as doping gas at the time of formation of this silicon carbide film (93).

[0064] The resist film with a thickness of 3 micrometers was applied on the silicon carbide film (93), the wedge-shaped mask was let pass and developed [exposed and] with lithography, and it left the wedge-shaped resist (94) ( drawing 9 (b)).

[0065] Subsequently, Si layer (92) and the silicon carbide layer (93) of a part by the conditions of Table 7 in which a mask is not carried out by RIE were removed by having used the resist (94) of this wedge shape as the mask, and the quartz substrate side (91a) was exposed (drawing 9 (c)).

[0066] Subsequently, the exposure (91a) of the quartz which is an insulating substrate (91) was etched with HF (hydrogen fluoride) solution 5% by having used the resist (94) as the mask, it removed in a depth of about 1 micrometer, and a new quartz substrate side (91b) was exposed (drawing 9 (d)).

[0067] Subsequently, by the spatter, after making a tungsten (95a and 95b) with a thickness of 1 micrometer deposit (drawing 10 (e)), the tungsten film (95b) the resist (94) on the silicon carbide film (93) and on it was removed by developing negatives with the developer of resist (drawing 10 (f)).

[0068] Next, the quartz in the meantime was shaved by etching by having used as the mask the silicon carbide (93) which should serve as tungsten film (95a) on the quartz substrate (91b) which should serve as a gate electrode, and an emitter, and the slot (clearance) (91b) was formed. The field-electron-emission component of the horizontal type by which the emitter (93) and the gate electrode (95a) have been arranged through this slot was formed (drawing 11).

[0069] Since the acute section (emitter) which carries out electric-field concentration in the emitter for field-electron-emission components of the example 2 is formed with the single silicone carbide which is excellent in thermal resistance, secure [to the Joule's heat accompanying high current density/sufficient thermal resistance and stability] is clear. Moreover, since the emitter front face which consists of silicon carbide has sufficient resistance and sufficient mechanical reinforcement to oxidation or etching, its long-term stability of the emission current improves.

[0070] The electrical potential difference which silicon carbide degenerates, and a surface electron affinity is set to 3eV or less, and is impressed to a gate electrode since 70 ppm N (donor impurity) is added by the silicon carbide which constitutes an emitter- - several 10- -it decreases to about -100V.

[0071] In the emitter of an example 2, since the 70 ppm impurity is added and impurity level is located in the conduction band of silicon carbide, the electronic excitation process between impurity-bands will be controlled and the emission current from an emitter will not change to heat, light, crystal orientation, and a crystal polymorphism. Furthermore, since the forbidden-band width of face (2.2-2.8eV) of silicon carbide is remarkable and wider than the forbidden-band width of face (1.12eV) of silicon, it is the field-electron-emission component which operates to stability also in an elevated temperature 500 degrees C or more."

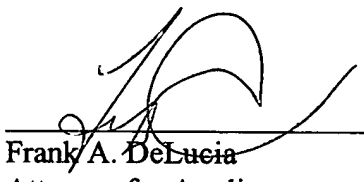
Each item of information listed on the Form PTO-1449 in this information disclosure statement was first cited in any communication from a foreign Patent Office in a counterpart foreign application not more than three months prior to the filing date of this Statement.

It is respectfully requested that the above information be considered by the Examiner and that a copy of the enclosed Form PTO-1449 be returned indicating that such information has been considered.

It is believed that no fee is required to have this Information Disclosure Statement considered by the Examiner. However, if a fee is deemed required, please charge Deposit Account 06-1205.

Applicants' undersigned attorney may be reached in our New York office by telephone at (212) 218-2100. All correspondence should continue to be directed to our address given below.

Respectfully submitted,



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| FORM PTO 1449 (*modified*)<br>U.S. DEPARTMENT OF COMMERCE<br>PATENT AND TRADEMARK OFFICE<br>LIST OF REFERENCES CITED BY APPLICANT(S)<br>(Use several sheets if necessary) | ATTY DOCKET NO.<br>**03500.015726** | APPLICATION NO.<br>**09/941,595** |
|---|---|---|
| | APPLICANT<br>**TAKEO TSUKAMOTO** | |
| | FILING DATE<br>**August 30, 2001** | GROUP<br>**2879** |



U.S. PATENT DOCUMENTS

| *EXAMINER INITIAL | | DOCUMENT NUMBER | DATE | NAME | CLASS | SUBCLASS | FILING DATE IF APPROPRIATE |
|---|---|---|---|---|---|---|---|
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FOREIGN PATENT DOCUMENTS

| | | DOCUMENT NUMBER | DATE | COUNTRY | CLASS | SUBCLASS | TRANSLATION YES/NO/ OR ABSTRACT |
|---|---|---|---|---|---|---|---|
| | | **08-100328** | **04/1996** | **JP** | | | **Abstract** |
| | | **2000-191302** | **7/2000** | **JP** | | | **Abstract** |
| | | **9-237565** | **9/1997** | **JP** | | | **Abstract** |
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OTHER DOCUMENT(S) (Including Author, Title, Date, Pertinent Pages, Etc.)

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| EXAMINER | DATE CONSIDERED |
|---|---|

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.



Form #62